

## **Claims**

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

1           1. (currently amended) An electronic ballast  
2 comprising:  
3           a phase dimmer compatible circuit including an input  
4           rectifier circuit for rectifying an input  
5           voltage;  
6           a voltage inverter circuit for receiving a rectified  
7           input voltage from said phase dimmer compatible  
8           circuit ~~input rectifier circuit~~, and for  
9           providing ~~voltage/current~~ a voltage and/or  
10          current to a discharge lamp for providing a  
11          dimmable light;  
12          ~~a controller for controlling the operation of the~~  
13          ~~voltage inverter circuit~~, and  
14          a keep-alive feedback circuit for feeding back  
15          energy from said discharge lamp to said ~~voltage~~  
16          ~~inverter circuit~~ phase dimmer compatible  
17          circuit to support ~~allow~~ a high dimming  
18          operation.

1           2. (original) The ballast of claim 1, wherein said  
2 keep-alive feedback circuit utilizes a capacitor for said  
3 feeding back energy.

1           3. (currently amended) The ballast of claim 1,  
2 wherein  
3           said input rectifier comprises a plurality of  
4           diodes, and further wherein

5        said keep-alive feedback circuit comprises a  
6            capacitor connected to both said phase dimmer  
7            compatible circuit ~~rectifier circuit~~ and the  
8            discharge lamp for ensuring that at least one  
9            of said plurality of diodes is always  
10          conducting.

1        4. (currently amended) The ballast of claim 1  
2 further comprising:  
3        a controller; and  
4        a constant voltage supply circuit connected to said  
5            ~~rectifier circuit~~ phase dimmer compatible  
6            circuit and for supplying a substantially  
7            constant voltage to said controller, wherein  
8        said constant voltage supply circuit uses a voltage  
9            of one or both of the discharge lamp and said  
10          inverter circuit to provide said a  
11          substantially constant voltage to said  
12          controller when the input current is low due to  
13          the high dimming operation.

1        5. (currently amended) ~~The~~ An electronic ballast ~~of~~  
2 ~~claim 1, comprising:~~  
3        a phase dimmer compatible circuit including an input  
4            rectifier circuit for rectifying an input  
5            voltage;  
6        a voltage inverter circuit for receiving a rectified  
7            input voltage from said phase dimmer compatible  
8            circuit, and for providing a voltage and/or  
9            current to a discharge lamp for providing a  
10          dimmable light; and

11        a keep-alive feedback circuit for feeding back  
12                energy from the discharge lamp to said phase  
13                dimmer compatible circuit to support a dimming  
14                operation, wherein  
15        said input rectifier circuit includes: a plurality  
16                of diodes operating at a frequency above the  
17                frequency of the input voltage, wherein at any  
18                given time at least one diode is in a  
19                conducting mode due to said keep-alive feedback  
20                circuit.

1            6. (original) The ballast of claim 5, wherein said  
2        rectifier circuit further includes a capacitor for  
3        reducing a crest factor of the discharge lamp.

1            7. (original) A dimmable discharge lighting  
2        apparatus comprising:  
3                the electronic ballast of claim 1; and  
4                said discharge lamp, wherein  
5                said apparatus is for providing a dimmable light  
6                        when connected to a dimming circuit for  
7                        providing the input voltage.

1            8. (currently amended) An electronic ballast  
2        comprising:  
3                a phase dimmer compatible circuit including an input  
4                        rectifier circuit for rectifying an input  
5                        voltage;  
6                a voltage inverter circuit for receiving a rectified  
7                        input voltage from said input rectifier  
8                        circuit, and for providing ~~voltage/current~~ a

9           voltage and/or current to a discharge lamp for  
10           providing a dimmable light;  
11       a controller for controlling the operation of the  
12           voltage inverter circuit; and  
13       a constant voltage supply circuit for supplying a  
14           substantially constant voltage to said  
15           controller, wherein  
16       said constant voltage supply circuit provides said  
17           substantially constant voltage both at low  
18           input currents and at high input currents, and  
19           wherein  
20       said constant voltage supply circuit provides a  
21           substantially constant voltage related to one  
22           or both of a voltage of said inverter circuit  
23           and a voltage of the discharge lamp.

1       9. (original)The ballast of claim 8, wherein said  
2       constant voltage supply circuit uses a voltage of the  
3       discharge lamp to generate said substantially constant  
4       voltage during the low input currents, and further  
5       wherein said constant voltage supply circuit uses said  
6       voltage pulses of said inverter circuit to generate said  
7       substantially constant voltage during the high input  
8       currents.

1       10. (currently amended) The ballast of claim 8,  
2       wherein said input voltage is from a dimming circuit, and  
3       wherein said constant voltage supply circuit includes:  
4       a first capacitor connected to said inverter circuit  
5           for generating a first current based on the

6 voltage of said inverter circuit during a low  
7 dimming operation of the dimming circuit; and  
8 a second capacitor connected to the discharge lamp  
9 for generating a second current based on the  
10 voltage of ~~said~~ the discharge lamp during a  
11 high dimming operation of the dimming circuit,  
12 wherein  
13 said constant voltage supply circuit sums said first  
14 current and said second current to generate  
15 said substantially constant voltage.

1 11. (original) The ballast of claim 10, wherein said  
2 constant voltage supply circuit further includes a  
3 plurality of diodes for rectifying said first current and  
4 said second current.

1 12. (original) The ballast of claim 8 further  
2 comprising a keep-alive feedback circuit for feeding back  
3 energy from said discharge lamp to said voltage inverter  
4 circuit to allow a high dimming operation of said  
5 apparatus.

1 13. (original) A dimmable discharge lighting  
2 apparatus comprising:  
3 the electronic ballast of claim 8; and  
4 said discharge lamp, wherein  
5 said apparatus is for providing said dimmable light  
6 when connected to a dimming circuit for  
7 providing the input voltage.

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1        14. (currently amended) An electronic ballast  
2 comprising:  
3        ~~an~~ a phase dimmer compatible circuit including an  
4                input rectifier circuit for rectifying an input  
5                voltage from a dimming circuit;  
6        a voltage inverter circuit having solid-state  
7                switches for receiving a rectified input  
8                voltage from said input rectifier circuit, and  
9                for providing a voltage and/or current  
10               ~~voltage/currents~~ to a discharge lamp for  
11               providing a dimmable light;  
12        a controller for controlling the operation of the  
13               voltage inverter circuit;  
14        a keep-alive feedback circuit for feeding back  
15               energy from said discharge lamp to said ~~voltage~~  
16               ~~inverter circuit~~ phase dimmer compatible  
17               circuit to allow a high dimming operation; and  
18        a constant voltage supply circuit for supplying a  
19               substantially constant voltage to said  
20               controller, wherein said constant voltage  
21               supply circuit uses a voltage of the discharge  
22               lamp to generate said substantially constant  
23               voltage during a high dimming operation of the  
24               dimming circuit, and further wherein said  
25               constant voltage supply circuit uses said  
26               voltage/current of said inverter circuit to  
27               generate said substantially constant voltage  
28               during a low dimming operation of the dimming  
29               circuit.

1        15. (original) The ballast of claim 14, wherein said  
2 input rectifier includes:

3        a plurality of rectifier diodes operating at a  
4            frequency above the frequency of the input  
5            voltage, wherein at any given time at least one  
6            diode is in a conducting mode due to said keep-  
7            alive feedback circuit; and

8        a capacitor for reducing a crest factor of the  
9            discharge lamp

1        16. (original) The ballast of claim 15, wherein said  
2 constant voltage supply circuit includes:

3        a first capacitor connected to said inverter circuit  
4            for generating a first current based on a  
5            voltage of said inverter circuit; and

6        a second capacitor connected to the discharge lamp  
7            for generating a second current based on a  
8            voltage of said discharge lamp, wherein

9        said constant voltage supply circuit sums the first  
10            current and the second current to generate said  
11            substantially constant voltage.

1        17. (original) The ballast of claim 16, wherein said  
2 keep-alive feedback circuit utilizes a capacitor for said  
3 feeding back energy.

1        18. (original) A dimmable discharge lighting  
2 apparatus comprising:

3        the electronic ballast of claim 17; and

4        said discharge lamp, wherein

5        said apparatus is for providing a dimmable light  
6                when connected to the dimming circuit having a  
7                phase dimmer.

1        19. (original) A dimmable discharge lighting  
2 apparatus comprising:

3        the electronic ballast of claim 14; and

4        said discharge lamp, wherein

5        said apparatus is for providing a dimmable light  
6                when connected to the dimming circuit having a  
7                phase dimmer.

1        20. (original) The ballast of claim 14, wherein said  
2 constant voltage supply circuit includes:

3        a first capacitor for generating a first current  
4                based on a voltage of the discharge lamp; and

5        a second capacitor for generating a second current  
6                based on a voltage output by said inverter  
7                circuit, wherein

8        said constant voltage supply circuit sums the first  
9                current and the second current to generate said  
10               substantially constant voltage.

1        21. (new) The ballast of claim 1, wherein said  
2 rectifier circuit is operated at a switching frequency of  
3 about that of said inverter circuit and different from a  
4 switching frequency of said input voltage to maintain a  
5 substantially constant input current.

1        22. (new) The ballast of claim 1, wherein said phase  
2 dimmer compatible circuit further includes a plurality of



3 capacitors connected at a common point, and wherein said  
4 keep-alive feedback circuit feeds back said energy to  
5 said common point.

1 23. (new) The ballast of claim 22, wherein said  
2 rectifier circuit includes a plurality of diodes, and  
3 wherein said plurality of capacitors is at least three  
4 and further wherein each of said plurality of capacitors  
5 is connected to at least one of said plurality of diodes  
6 in said rectifier circuit.

1 24. (new) The ballast of claim 23, wherein said  
2 common point is not directly connected to any of said  
3 plurality of diodes in said rectifier circuit.

1 25. (new) The ballast of claim 8, wherein said  
2 constant voltage supply circuit provides said  
3 substantially constant voltage by obtaining energy from  
4 both said inverter circuit and the discharge lamp.

1 26. (new) An electronic ballast for use with an  
2 external phase dimmer comprising:

3 a phase dimmer compatible circuit including a  
4 rectifier circuit adapted for rectifying a  
5 variable input current;  
6 an inverter circuit coupled to the phase dimmer  
7 compatible circuit for converting the rectified  
8 current into high frequency alternating current  
9 to power a discharge lamp;  
10 a feedback circuit for feeding back current from the  
11 discharge lamp to the phase dimmer compatible  
12 circuit in order that the phase dimmer

13 compatible circuit can draw substantially  
14 continuous current from the external phase  
15 dimmer.

1 27. (new) The ballast of claim 26 wherein the phase  
2 dimmer compatible circuit comprises a plurality of diodes  
3 configured in a full wave bridge configuration and  
4 operating at a frequency substantially the same as the  
5 inverter circuit.

1 28. (new) The ballast of claim 27 wherein at any  
2 given time at least one diode is in a conducting mode.

1 29. (new) The ballast of claim 27 wherein the phase  
2 dimmer compatible circuit further comprises a capacitor  
3 for reducing the crest factor of the discharge lamp.

1 30. (new) The ballast of claim 26 further  
2 comprising:

3 a dimming control circuit for controlling the  
4 operation of the inverter circuit through a  
5 dimming range;

6 a constant voltage supply circuit for providing a  
7 substantially constant voltage to the dimming  
8 control circuit, said constant voltage relating  
9 to one or more of a voltage of said inverter  
10 circuit and said discharge lamp.

1 31. (new) An electronic ballast for use with an  
2 external phase dimmer comprising:

3 a phase dimmer compatible circuit including a  
4 rectifier circuit adapted for rectifying a  
5 variable input current;

6 an inverter circuit coupled to the phase dimmer  
7 compatible circuit for converting the rectified  
8 current into high frequency alternating current  
9 to power a discharge lamp;  
10 a dimming control circuit for controlling the  
11 operation of the inverter circuit through a  
12 dimming range;  
13 a constant voltage supply circuit for providing a  
14 substantially constant voltage to the dimming  
15 control circuit, said constant voltage relating  
16 to one or more of a voltage of said inverter  
17 circuit and said discharge lamp.

1 32. (new) The ballast of claim 31 further comprising  
2 a feedback circuit for feeding back current from the  
3 discharge lamp to the phase dimmer compatible circuit in  
4 order that the phase dimmer compatible circuit can draw  
5 substantially continuous current from the external phase  
6 dimmer.